

the past few days have done great damage. At Howard City great damage is reported along the railroads.

Watertown, Jefferson Co., N. Y., 18th: the unusually dry weather that has prevailed throughout northern New York, besides ruining the hay crop, has resulted in a large loss to farmers and others by fire. Many valuable pieces of timber, as well as fencing and other property, were destroyed, and the losses will amount to many thousands of dollars.

Prairie and forest fires occurred also as follows: Fort Reno, Ind. T., 4th, 6th, 8th; Fort Bridger, Wyo., 10th, 15th; Fort Sill, Ind. T., 23d to 31st; Ashland, Oregon, 25th.

#### HALOS.

The dates on which solar halos were observed over the greatest extent of territory during July were from the 6th to 11th, 16th, 23d, and 31st; they were least numerous on the 4th, 12th, 19th, 22d, and 27th; none were observed on the 20th. They were observed on from eight to thirteen days in Dak., Ill., La., Mich., N. Y., Ohio, Va.; Ohio reporting the maximum; none were reported from Ala., Colo., Conn., Del., D. C., Md., Miss., Mont., Nebr., N. Mex., R. I., W. Va., Wyo.

But few lunar halos were reported during the first half of the month, there being eleven days during that period on which none were recorded; the greatest number, though not numerous, were reported on the 17th and 22d, in eight states and territories. They were seen on from five to seven days in Ark., Ind., Mo., Tex. None were reported from Ala., Cal., Colo., Conn., Dak., Del., D. C., Idaho, Ind. T., Ky., Me., Md., Miss., Mont., N. Mex., N. Y., Ohio, Oregon, R. I., S. C., Utah, Vt., Wis., Wyo.

The phases of the moon, Washington mean time, during July, as given in "The American Ephemeris and Nautical Almanac," are as follows: new moon, 8th, 13h. 8.4m.; first quarter, 15th, 19h. 4.6m.; full moon, 22d, 12h. 36.9m.; last quarter, 30th, 3h. 21.4m.; apogee, 3d, 5.3h.; perigee, 18th, 24.0h.; apogee, 31st, 0.9h.

#### METEORS.

New York City: a meteor of unusual brilliancy was observed at 10.10 p. m. on the 4th; it crossed the sky from the northwest to the southeast and had the appearance of an ordinary sky rocket.

Fort Stanton, N. Mex.: a very brilliant meteor was observed at 11 p. m., 4th; it was first visible in Azimuth 190° and altitude 30° and traveled about 20° in a southwesterly direction.

Webster, Day Co., Dak.: a large meteor was observed about 10 p. m., 11th; it exploded in the north at an altitude of 45°; the meteor was similar to the sun in brightness and objects cast shadows to the south.

Montrose, Colo.: an unusually bright meteor was observed in the north, altitude 35°, at 11.30 p. m., 22d; it moved in a northerly direction and was visible for about three seconds. The meteor was followed by a long ray of light which remained in sight for about eighteen seconds.

Auburn, Ala.: an unusually large meteor was observed in the north at 9 p. m., 25th; it left a blue streak in its path.

Butlerville, Jennings Co., Ind.: a bright meteor was observed on the evening of the 25th; it passed almost due east of this place and disappeared with a loud report; the meteor was accompanied by a luminous trail which was visible for about ten seconds.

Knoxville, Tenn.: a brilliant meteor was observed falling directly under the polar star at 10.35 p. m., 26th.

Meteors were also observed as follows: 1st, Kalamazoo, Mich.; Stateburg, S. C. 3d, 10th, 19th, 23d, 24th, Kalamazoo, Mich. 4th, Banning Cal.; Marion, Va. 5th, Yaquina Light House, Oregon. 6th, Kalamazoo, Mich.; Wauseon, Ohio; Marion, Va. 8th, Blue Hill Observatory, Mass. 11th, Webster, Dak.; Cedar Rapids, Iowa; Kalamazoo, Mich.; Tiffin, Ohio. 13th, Yuma, Ariz.; Manchester, N. H.; Cleburne and Mesquite, Tex.; Rappahannock, Va. 14th, Newburyport, Mass. 15th, 17th, Utica, N. Y. 18th, Cedar Rapids, Iowa; Kalamazoo, Mich. 22d, Banning, Cal.; Montrose, Colo.; Kalamazoo, Mich.; Beverly and Egg Harbor City, N. J. 24th, Newburyport, Mass. 25th, Jacksonborough, Ohio; Cleburne, Tex. 26th, Webster, Dak.; Kalamazoo, Mich.; Cleburne, Tex.; Rappahannock, Va. 28th, Cedar Rapids, Iowa; Jacksonborough, Ohio; Stateburg, S. C.; Marion, Va. 29th, Kalamazoo, Mich.; Cleburne, Tex. 30th, Cleburne, Tex.; Marion, Va. 31st, Lead Hill, La.

#### MIRAGE.

The only stations reporting mirage during the month were Webster, Dak., on the 2d, 3d, 5th, 6th, 9th, 10th, 12th, 14th to 25th, 31st; and Yuma, Ariz., on the 2d.

#### SAND STORMS.

Red Bluff, Cal.: a dust whirl occurred in this city at 3 p. m. on the 18th, its diameter being about thirty feet; it rose into the air fully 2,000 feet, and when it reached its maximum height the column broke and the dust flew off laterally in all directions. A similar dust whirl, which rose about 10,000 feet in the air, is reported to have been observed at the same time five miles east of this city.

Sand storms occurred also as follows: Rio Grande City, Tex., 9th, 10th, 25th, 29th; Fort McDowell, Ariz., 18th, 19th; Fort Bowie, Ariz., 23d, 26th.

#### VERIFICATIONS.

The percentages of verifications of the official indications of the Signal Service for July, 1888, were not completed in time to be published in this REVIEW. They will be published in a later number.

#### LOCAL VERIFICATIONS.

The following extracts from the published reports of the state weather services for July, 1888, show the percentages of verification of weather and temperature signals for the various states:

*Michigan.*—Weather signals are now displayed in one hundred and thirty towns in the state, and upon the baggage-cars of twenty-six trains of eight of the principal railroads of the state.

The indications are issued at 10 p. m., daily, from the Chief Signal Office, Washington, and are for the twenty-four hours from 7 a. m. to 7 a. m.

The percentage of verification of these indications for July is as follows (the verification is taken from reports of displaymen furnished this office

monthly): temperature, 79.3 per cent; weather, 80.7 per cent.; temperature and weather, 80.0 per cent.

Weather signals are displayed on the baggage cars of the following railroads: C. & G. T. R'y; D., G. H., & M. R'y; D. D. G. T. R'y; M. C., main line and branches; C. & W. M. R'y; G. R. & I. R'y; P. H. & N. W. R'y; and the P. O. & P. A. R'y.

*Minnesota.*—The verification of weather signals were: 72 per cent. for weather, and 79 per cent. for temperature.

*Nebraska.*—The percentages of correct weather predictions for the state were: temperature, 81.6; weather, 78.0; mean, 79.8.

*Ohio.*—The percentage of verification of weather signals received from the Signal Office in Washington, and distributed to twenty-nine display stations, was 81 for weather, and 81 for temperature.

*Oregon.*—At Albany, weather, 78 per cent.; temperature, 84 per cent. At Roseburg, weather, 81 per cent.; temperature, 55 per cent. General average for the state, 75 per cent.

*South Carolina.*—The percentage of verification of the weather and temperature predictions for the state was: weather, 75.0; temperature, 80.0.

#### STATE WEATHER SERVICES.

The following extracts are republished from reports for July, 1888, of the directors of the various state weather services:

## ALABAMA.

The month has been about an average July in all respects except in the amount of rain. The temperature was only  $0^{\circ}.3$  above the normal. A few days were quite warm but most of the period was mild, and in most sections of middle and north Alabama the nights were cool and pleasant.

The precipitation was 2.48 inches below the normal. This deficit, however, has produced no serious results because the preceding weeks had given a sufficient amount of rain to greatly advance the crops. The rain was not evenly distributed over the state, some sections having less than one inch.

## Summary.

*Temperature (in degrees Fahr.).*—Monthly mean, 80.9; highest monthly mean, 84, at Selma; lowest monthly mean, 77, at Valley Head; maximum, 100, at Opelika on the 26th, Pine Apple on the 15th, and Marion on the 30th; minimum, 64, at Fort Deposit on the 30th, Gadsden on the 21st, Mount Willing on the 20th, and Talladega on the 24th; range for state, 36; greatest local monthly range, 42, at Marion; least local monthly range, 19, at New Market.

*Precipitation (in inches).*—Average for the state, 3.08; greatest, 6.00, at Edwardsville; least, 0.76, at Tusculumbia.

*Wind.*—Prevailing direction, southeast.—P. H. Mell, jr., Signal Corps, Auburn, director.

## ARKANSAS.

*Temperature (in degrees Fahr.).*—Monthly mean, 82.1; highest monthly mean, 87.8, at Malvern; lowest monthly mean, 74.3, at El Dorado; maximum, 111.0, at Lead Hill on the 31st; minimum, 56.0, at Forrest City on the 22d; monthly range for state, 55.0; greatest local monthly range, 53.0, at Lead Hill; least local monthly range, 24.0, at Dayton.

*Precipitation (in inches).*—Average for the state, 3.07; greatest, 8.89, at Dallas; least, 0.26, at Malvern.—Prof. John C. Branner, Little Rock, director; W. U. Simons, Private, Signal Corps, assistant.

## ILLINOIS.

The noticeable features of July have been a marked uniformity of atmospheric pressure and irregularity in rainfall.

From the 1st to the 8th the oscillations of the barometer were very slight, the pressure being slightly above the average. On the 9th and 10th the only decided "Low" of the month occurred, and from that date until the end of the month the pressure was mostly above the average. The lowest barometer was on the 10th and the highest on the 20th.

The temperature was nearly the average, except at a few stations where it was the average or slightly above. The middle of the month was comparatively cool, but the first and last days were extremely hot. The hottest days were the 7th and 31st; the coolest day was the 14th. During the last days of the month the temperature was everywhere above  $90^{\circ}$ , and in some instances above  $100^{\circ}$ .

A marked feature of the month was the great wind and rain storm, on the afternoon of the 4th, which swept across Iowa and this state, doing immense damage to standing crops. In Illinois the oat crop, which had never been so promising, was probably damaged one-third by the wind.

The heaviest and most general rainfall of the month occurred on the 8th and 9th. The following are some of the largest amounts reported: Atwood, 4.68 inches; Mahomet, 3.36; Anna, 2.50; Aledo, 2.42; Peoria, 2.00; Beason, 1.95; Springfield, 1.81; Paris, 1.76; Greenfield, 1.79; Oswego, 1.60. At Peoria on the 8th 1.10 inches fell in thirty minutes; but probably the heaviest rainfall of the month was at Pekin, on the 26th, when 2.20 inches fell in an hour. The heaviest continuous rainfall of which this office has any record occurred, however, on the evening of the 8th and morning of the 9th, in Champaign county, 6.10 inches falling at Philo in twenty-two hours. All the rainfall of the month was in showers, mostly heavy, but varying greatly in amount—in some places far above the average, and in others, only a few miles distant, far below. There was a fall of 3.86 inches at Philo; 7.94 at Pekin; 7.06 at Atwood; 6.81 at Griggsville; 6.48 at Peoria; 6.30 at Jacksonville; while only 0.70 inch was the total for the month at Joliet.—Col. Charles F. Mills, Springfield, director; James Cassidy, Sergeant, Signal Corps, assistant.

## INDIANA.

The temperature during the month was not unusually high; cool nights and moderately warm days prevailed, except on a few days, when the advance of the slight barometric pressure on the 3d and 4th, 8th and 9th and 29th, 30th and 31st were accompanied by temperatures during the day above  $90^{\circ}$ , and on the 6th and 7th with a higher barometer. Comparing the temperature of July, 1888, with the temperature of July, 1887, an exceedingly great difference will be noted; during the latter the heat was intense each day without interruption, and the maximum temperature everywhere was higher, while during July, 1888, exceedingly high temperatures were reached on comparatively few days.

On account of the very heavy rains on July 8th and 9th, the amount of precipitation was slightly in excess at many stations. The few other rains which fell were badly distributed and of small amount, falling only in passing local showers. Small hail fell on the 23d at Maury and on the 28th at Vevay.

The general conditions of the weather during July were favorable to the harvesting of hay and cereals, and, although during the latter part of the month there was hardly sufficient precipitation, the conditions of the weather were also quite beneficial to the growth and maturing of corn, which, at the end of the month, is in excellent condition and promising a better harvest, both in re-

gard to quantity and quality, than the farmers of Indiana have reaped in many years.—Prof. H. A. Huston, Lafayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.

## KANSAS.

Two hot waves during this month carried its mean temperature above the July normal, Shawnee county standing alone with a mean temperature  $0^{\circ}.3$  below the normal, while in Leavenworth county it is  $0^{\circ}.2$  above the normal. The excess is quite uniform in the eastern counties south of the Kaw, where it is  $1^{\circ}.5$ . In general terms, this excess increases west from the eastern counties of the state, culminating in the counties from Republic to Sumner, where it is  $2^{\circ}$  and upwards. It then diminishes slightly till the 100th meridian is reached, where it is about  $1^{\circ}.4$  above the normal. It then increases slightly to the west line of the state. The mean temperature for the state is  $81^{\circ}$ , which varies in the different divisions, being  $80^{\circ}$  in the western,  $82^{\circ}$  in the middle, and  $81^{\circ}$  in the eastern.

Three "rainy spells" passed across the state, occurring about the 8th, 16th, and 24th, giving us an average of 2.64 inches. Of the total amount, the eastern division received 32 per cent., the middle division 28 per cent., and the western division 40 per cent.

## Summary.

*Temperature (in degrees Fahr.).*—Monthly mean, 81; highest monthly mean, 84, at Carneiro and Salina; lowest monthly mean, 77, at Goodland and Topeka; maximum, 117, at Bunker Hill, on the 31st; minimum, 49, at Goodland, on the 18th; range for state, 68; greatest local monthly range, 58, at Ellsworth; least local monthly range, 28, at Coldwater; greatest daily range, 49, at Tribune, on the 4th; least daily range, 7, at Goodland, on the 8th.

*Precipitation (in inches).*—Average for the state, 2.64; greatest, 7.00, at Morse; least, .30, at Cawker City.

*Wind.*—Prevailing direction, south.—Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.

## LOUISIANA.

An excess of  $1^{\circ}.0$  is noted in the average temperature for the state during the month of July, 1888. During the past seventeen years there have been eight Julys when the average temperature was lower than that for the month just passed; the coolest of which was July of 1882, when the mean was  $79^{\circ}.4$ . The excess for the past month occurred in the northern section of the state, the mean for the southern section being about the normal.

There was a deficiency of one and one-half inches in the average rainfall for the state during the past month, being a deficiency of one inch in the northern section and two inches in the southern section. The southern part of the state received one inch more rainfall than the northern part. The distribution was unequal, and the rains generally local in character. Trinity and Lafayette alone report a daily rainfall exceeding two inches.

## Summary.

*Temperature (in degrees Fahr.).*—Monthly mean, 82.6; highest monthly mean, 84.8, at Vidalia; lowest monthly mean, 78.1, at Lafayette; maximum, 102, at Minden on 16th and 26th; and at Liberty Hill on 14th, 24th, 25th, and 26th; minimum, 60, at Calhoun on the 22d and 23d; and at Liberty Hill on 22d and 23d; range for state, 42; greatest local monthly range, 42, at Liberty Hill; least local monthly range, 24.5, at New Orleans; greatest average daily range, 27.0, at Liberty Hill; least average daily range, 14.3, at New Orleans.

*Precipitation (in inches).*—Average for the state, 3.44; greatest, 6.77, at Lafayette; least, 0.84, at Girard.

*Wind.*—Prevailing direction, south.—R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.

## MICHIGAN.

*Temperature (in degrees Fahr.).*—The mean temperature for July,  $69.8$ , is  $1.4$  below the normal of thirteen years. The temperature was below the normal in all sections during July. The greatest deviation occurred in the upper peninsula, and the least in the northern and southern sections. There has been but a small change in the daily temperature this month. The mean daily temperature was above the normal on eleven days, and below the normal on sixteen days, being normal on four days. The highest mean daily temperature, 77, occurred on the 3d and 30th, when the temperature was 6 and 5 above the normal, and the lowest, 60, when the temperature was 12 below the normal. The highest mean daily temperature for the past thirteen years occurred on the 19th, 1876, 89, and the lowest, 60, occurred on the 4th, 1882, and 12th, 1888. The highest mean monthly temperature,  $74.3$ , occurred in 1876 and 1878, and the lowest,  $66.7$ , occurred in 1884. The maximum temperature, 100, occurred at Houghton on the 3d, and at Omer on the 30th. The warm days occurred on the 3d, 4th, 5th, and 6th, 29th, and 30th. The temperature was reported above the normal at only two stations, viz: Adrian, excess  $0.6$ , and at Marshall, excess  $1.1$  for the month.

*Precipitation (in inches).*—The average amount of precipitation for July, 1.92, is  $1.40$  below the normal of thirteen years. The precipitation was below the normal in all sections, the greatest deficiency occurring in the upper peninsula and the least in the northern section. In the central section the greatest deficiency occurred in the counties of Huron, Gratiot, Clinton, Ionia, Macomb, and Ingham. In the southern section there was a deficiency in the counties of Berrien, Branch, Calhoun, Hillsdale, and Jackson. General rains occurred on the 8th, 12th, 18th, 22d, 26th, and 31st.

*Wind.*—Prevailing direction, southwest.—N. B. Conger, Sergeant, Signal Corps, Lansing, in charge.

## MINNESOTA.

The most notable feature of the month was the frequency of thunder-storms. The average was one every three days for each station, and many of the storms were violent, especially in the southern division of the state.

*Temperature (in degrees Fahr.).*—Considering the whole state, the temperature was nearly 1 below the normal. In the vicinity of Saint Paul and Minneapolis the temperature was about normal. There was a deficiency of from 1 to 2 in the southern part of the state, and in the vicinity of Lake Superior the deficiency amounted to 3.

*Precipitation (in inches).*—An average amount of rain fell during the month, but the distribution was not equal. At Saint Paul there was an excess of 2.26 over the normal of seventeen years. In the southern and eastern counties there was a slight deficiency. At Saint Vincent there was a deficiency of 0.15 as compared with previous months of the same name.

*Wind.*—The prevailing direction of wind, southwest.—*Prof. W. W. Payne, Northfield, director; John Healy, Private, Signal Corps, Saint Paul, assistant.*

## MISSISSIPPI.

*Temperature (in degrees Fahr.).*—Monthly mean, 82; highest monthly mean, 86, at Columbus; lowest monthly mean, 79, at Corinth; maximum, 104, at Columbus on 5th, and Brookhaven on 14th; minimum, 56, at Corinth on 28d; range for state, 48; greatest local monthly range, 44, at Corinth; least local monthly range, 21, at Biloxi; greatest daily range, 36°, at Hazlehurst; least daily range, 1, at Pearlinton. The monthly mean temperature, 82, is the same as it was for this month last year and is about the normal. The maximum temperature at the different stations generally occurred on the 14th and the minimum on the 21st. The highest temperature reported during the month was 104 at Columbus on the 5th, and the same at Brookhaven on the 14th. The lowest temperature was 56 at Corinth on the 28d, and 60 at Port Gibson on the 22d.

*Precipitation (in inches).*—Average for the state, 3.41; greatest, 6.60, at Palo Alto and Aberdeen; least, 0.83, at Artonish Plantation. The average rainfall for the state 3.41, is very near the normal. Average rainfall for this month last year, 4.88. The rain was generally well distributed both as to quantity and time.—*Prof. R. B. Fulton, Oxford, director; M. J. Wright, Jr., Sergeant, Signal Corps, assistant.*

## MISSOURI.

The average temperature for July was 79°.2. The highest reported was 111°.0 at Protem, and the lowest was 50°.0 at Ironton. The average of maximum temperatures was 99°.2, and the average of minimum temperatures 61°.6, making an average monthly range of 37.6.

The average precipitation was 3.26 inches, which was 0.43 inch below the normal for July. The greatest amount reported was 10.48 inches at Kirksville, and least 0.50 inch at Springfield.—*Prof. Francis E. Nipher, Saint Louis, director; G. A. Weber, Sergeant, Signal Corps, assistant.*

## NEBRASKA.

The past month has been one of extremes of temperature but with a preponderance of hot days, and there has been throughout the state, except in the southwestern corner, about the normal rainfall.

*Precipitation (in inches).*—The rainfall has ranged from 1.00 at Red Willow to over 5.00 at De Soto and at Sargent, the heaviest rainfall extending along the Missouri River and also along the middle Loup; all but a small area in the southwestern corner of the state have had over 2.00, so that in general the rainfall has been greater than for the corresponding month in the two years past. What is also of importance the number of rainy days has been normal.

*Temperature (in degrees Fahr.).*—The mean temperature for the month has been over 3 above the normal; maximum for the state is 105 at Kimball, with maximum at other stations ranging above 100 generally; the minimum was 45 also at Kimball.

There has been a larger number than usual, however, of cloudy days. The weather has been generally favorable for nearly all crops.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

## NEVADA.

The temperature for July was slightly below and the pressure slightly above normal. The highest temperature reported, 113°, occurred at Eldorado Canyon on the 22d; and the lowest, 25°, occurred at Austin on the 19th.

The rainfall for July was light and considerably below the average. The heaviest fall reported was 1.13 inches at Ely, White Pine county.—*Prof. Charles W. Friend, Carson City, director; Charles A. Read, Sergeant, Signal Corps, assistant.*

## NEW ENGLAND METEOROLOGICAL SOCIETY.

The month is remarkable for its small number of warm days and its consequent low average temperature. In only a few instances were readings of 90° reached, and the average temperature at twenty-one stations shows a deficiency of 8°.8 when compared with the records of past years.

*Thunder-storms.*—These were numerous, and in a few instances wide-spread and destructive. On the 5th thunder-storms occurred in New Hampshire, Massachusetts, Rhode Island, and Connecticut, and on the 7th in Maine, New Hampshire, and Vermont; both series related to the low depression then passing near Newfoundland. On the night of the 11–12th severe showers were

general over New England, with high winds, which reached the violence of a tornado at Cambridge and Monson, Mass., and Canaan, N. Y. The unusual phenomenon of a luminous electric cloud 60° by 20°, with incessant lightning, was noted at Manchester, N. H. Between the 19th and 31st thunder was reported from some station on every day, except the 25th. The storms best developed in this interval were on 20th–21st in all the states of New England, on the 23d and 24th in Maine, New Hampshire, central Massachusetts, and Connecticut, and on the 31st in all of the states. Of these storms those on the 20th–21st and 31st were situated south and the others southwest of the centre of their respective depressions.

## Summary.

*Temperature (in degrees Fahr.).*—Monthly mean, 66.1 (93 stations); highest monthly mean, 70.6, at Olneyville and Hartford; lowest monthly mean, 61.1, at Berlin Falls; maximum, 94, at Stratford, on the 22d; minimum, 32, at Williamstown, on the 15th; range for New England, 62; greatest local monthly range, 58, at Berlin Mills; least local monthly range, 27, at Nantucket; greatest daily range, 49, at Berlin Mills, on the 2d; least daily range, 2, at Cambridge and Cotuit, on the 27th and 28th respectively.

*Precipitation (in inches).*—Average for New England, 2.38 (115 stations); greatest, 5.67, at Long Plain; least, 0.91, at Belmont.

*Wind.*—Prevailing direction, southwest.—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; O. N. Oswell, Sergeant, Signal Corps, Boston, Mass., assistant.*

## NEW JERSEY.

The mean temperature for July, 1888, 71°.1, is only three-tenths of a degree higher than the mean for June, and is 3°.4 below the average determined from past records of forty-eight stations. The highest temperatures (above 90°) were recorded on the 6th, 7th, 23d, and 24th, and the lowest (below 50°) on the 2d, 14th, 18th, and 19th.

The average rainfall for the state, 3.40 inches, is 0.82 inch below the July average, and was unevenly distributed. The largest total for the month, 7.03 inches, is reported from Burlington county, and the least, 1.25 inches, from Morris county. The largest total in twenty-four hours, 3.78 inches, occurred at Oceanic on the 19th, and at Moorestown, 3.13 inches, on the 19th and 20th.

## Summary.

*Temperature (in degrees Fahr.).*—Monthly mean, 71.2; highest monthly mean, 76.0, at Trenton; lowest monthly mean, 67.7, at Hanover; maximum, 99.0, at Lambertville, on 23d; minimum, 45.0, at Hanover and Tenaflly on 14th and 18th, respectively; range for state, 54; greatest local monthly range, 50, at Tenaflly; least local monthly range, 32, at Ocean City; greatest daily range, 42, at Tenaflly on 3d and 25th; least daily range, 2, at Oceanic on 9th.

*Precipitation (in inches).*—Average for the state, 3.50; greatest, 7.03, at Moorestown; least, 1.25, at Gillette.

*Wind.*—Prevailing direction, northwest and southwest.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

## NORTH CAROLINA.

*Temperature (in degrees Fahr.).*—Monthly mean, 76.4; highest monthly mean, 80.0, at Salisbury; lowest monthly mean, 73.9, at Lynchburg; maximum, 104, at Cheraw, S. C., on 9th; minimum, 52, at Weldon, on the 2d; range for state, 52; greatest local monthly range, 45, at Lambertton; least local monthly range, 28.4, at Hatteras.

*Precipitation (in inches).*—Average for the state, 3.45; greatest, 6.24, at Hatteras; least, 1.46, at Weldon.

*Wind.*—Prevailing direction, northeast.—*Dr. Herbert B. Battle, Raleigh, director; H. McP. Baldwin, Sergeant, Signal Corps, assistant.*

## OHIO.

*Temperature (in degrees Fahr.).*—The mean temperature of the northern section was 70.5; of the middle section, 72.3; and of the southern section, 78.6. These means are 1.5, 1.0, and 1.8 below the averages for these sections. The mean temperature for the state, 72.1, is 1.3 below the six-year mean. The maximum temperature, 97.0, occurred at Dayton on the 7th, and the minimum, 42.0, at Youngstown on the 13th. The mean daily range, 22.6, agrees with the mean range for July. The greatest daily range was 41.0 at Paulding on the 30th, and the least, 5.0, at Hiram on the 9th.

*Precipitation (in inches).*—General and very heavy rains occurred in all sections on the 8th, 9th, and 18th. General rains in all sections on the 4th and 5th; in the middle and southern sections on the 7th; in the northern section on the 12th, 23d, 26th, and 27th; and in the southern section on the 27th. Local rains occurred in the northern section on the 7th, 11th, 17th, 19th, 22d, and 31st; in the middle section on the 6th, 10th, 12th, 13th, 17th, 23d, and 27th; and in the southern section on the 10th, 13th, 17th, 19th, 23d, and 24th. The heaviest in any twenty-four hours occurred at Newcomerstown, where 4.04 of rain fell between 8 p. m. of the 8th and 8 p. m. of the 9th. The mean rainfall in the northern section was 3.44; for the middle section, 4.87; and for the southern section, 4.91. These means are .08, 1.26, and 1.50 above the means for July. The mean for the state, 4.40, is 0.94 above the average, making the deficiency for the year to August 1, 1.72. The cloud-burst and flood of the 19th, which caused so much damage and heavy loss of life at Wheeling, West Virginia, also caused considerable damage on the Ohio side at Martin's Ferry, Aetnaville, Bridgeport, Bellaire, and Saint Clairsville.—*Prof. B. F. Thomas, Columbus, president; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Private, Signal Corps, assistant.*

## PENNSYLVANIA.

*Temperature (in degrees Fahr.).*—The mean temperature for July, determined from the tri-daily observations, was 69.4, and from the mean maximums and mean minimums, 69.2. These are about 3 below the normal. At Philadelphia the monthly deficiency of temperature was 124, and at Pittsburgh, 113. The highest temperatures did not reach the average maximums by a few degrees, and the minimums ranged about 4 below those generally recorded in July. The extremes reported were, Charlesville, 97; Carlisle, 96; Huntingdon, 94.5; Somerset, 94.5; Quakertown, 94; Philadelphia, 93.8; York, 93.5; Chambersburg, 93.5; Reading, 93.5, the highest; and Coudersport, 38; Dyerberry, 39; Smethport, 39; Wellsborough, 40; Honesdale, 41; New Castle, 41; and Wysox, 41, the lowest. Most of the high temperatures occurred on the 4th and 7th, and the lowest on the 13th, 14th, and 16th. The nights were generally cool.

*Precipitation (in inches).*—There was an average of 3.45 of rainfall, which is from half to three quarters of an inch below the normal. It was fairly well distributed, although a few stations report decided departures from the average. The greatest totals were: Uniontown, 7.10; Indiana, 7.04; Beaver, 5.18; New Castle, 4.90; and Lock Haven, 4.75. The least were: Coudersport, 1.40; Smethport, 1.40; Drifton, 2.16; and Emporium, 2.17. The heaviest amounts fell on the 8th, 9th, 18th, 19th, and 27th. It was seasonably distributed throughout the month, and there were few complaints from drought.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant, in charge.*

## SOUTH CAROLINA.

The mean temperature for the month was 78° 9, being 3° 1 less than July, 1887, when 82° 0 was recorded. In most instances the highest maximum temperature occurred on the 8th and 9th; the minimum temperature on the 18th.

The mean depth of rainfall for the month was 3.68 inches, while the record for July, 1887, shows a mean depth of 7.49 inches. The greatest amount of precipitation occurred at Charleston, where a fall of 6.06 inches was recorded; and the least monthly precipitation, 1.50 inches, at Allendale.—*Hon. B. F. Butler, Columbia, director; William Line, Sergeant, Signal Corps, assistant.*

## TENNESSEE.

The month of July was characterized by two hot waves which prevailed during the first and last weeks, by the small percentage of cloudiness and deficient rainfall. The amount of electrical disturbances was rather less than usual.

*Temperature (in degrees Fahr.).*—The mean temperature was 77.6, a little above the July mean of the past six years, the highest during the period being that of last year. The highest local mean was 83, recorded at Woodstock, and the lowest was 74°, recorded at Greeneville. The maximum temperature recorded was 102, on the 29th, at Hohenwald, and was the highest during the six years. The minimum temperature was 54, recorded also at Hohenwald, this station showing the rare occurrence of the two extremes in one month. This was 2 below the minimum of July of last year, which was the highest recorded during the past six years. The maximum temperature was generally recorded on the 7th, 13th, 28th, and 31st, and the minimum on the 14th and 21st. The daily ranges were very near the normal.

*Precipitation (in inches).*—The mean precipitation was 2.60, more than 1.00 less than the July mean of the past six years. Of this amount the eastern division received an average of about 3.00, the middle division about 2.75, and the western division a little more than 1.50. The rains which fell during the month were mostly local in character, only three or four were what might be termed general rains falling during the month, these were on the 9th, 10th, 19th, and 29th. The greatest daily rain was on the 19th, and the greatest local rainfall in twenty-four consecutive hours was 2.38, on the 17th, at Ashwood, and the next was 2.15, on the 18th, at Waynesborough. At only a few stations was reported more than 1.00 of daily rainfall, and these are principally in the middle division. The greatest monthly rainfall was 5.00, recorded at Fostoria, and the least was 0.55, recorded at Lawrenceburg; the latter was the least amount recorded in July the past six years; the next being 0.67, at Howell, in Lincoln county, in 1886. Rain was reported on twenty-two days. Hail was reported at only one station during the month. Dews were reported at various stations on twenty-six days.

*Wind.*—The prevailing winds were west and southwest.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

## TEXAS.

The data used in this review is based upon the records received from sixteen special cotton region stations, nine regular stations of the Signal Service, and the 8 a. m. daily weather maps issued at Galveston. The weather for July in Texas has been slightly cooler than the average, the mean temperature averaging from 0.5° to 1° lower. Moderate rains were general in the state up to and including the 10th of the month. Since that date light showers here and there only have been reported. Later reports indicate that the country is suffering from drought, but not to any great extent, however. The meteorological features were uniform pressure and temperature, absence of general and destructive storms, and excessive precipitation.

*Temperature (in degrees Fahr.).*—The average temperature for the state for July was 83. The mean of maximum temperature for the state was 92.5, and the mean of minimum temperature 74.2. Compared with the month of June, the average maximum temperature was about 8 higher, and the average minimum temperature 2 higher. At seven places in the state the maximum temperature was reported 100 and over. The absolute range of temperature for the state was 46°. The average range for the state was 31.4. The great-

est monthly range reported was 41 at Fort Elliott and Sour Lake, and the least monthly range, 16, at Cuero. The highest temperature reported in the state was 105 at Sour Lake on the 2d, 15th, and 16th; the lowest temperature, 59, at Weatherford, on the 23d.

*Precipitation (in inches).*—The average rainfall for Texas for July was 2.25. This amount is 3.85 below the average for June of this year, and 0.80 below the normal for July, as deduced from observations covering a period of several years. The average monthly precipitation for four months—April, May, June, and July—for the state was 5.00. The following named places report amounts exceeding 2: Tyler, 7.83; Orange, 6.98; Palestine, 4.35; Columbia, 3.93; Corsicana, 3.57; Huntsville, 2.94; Houston, 2.91; Waco, 2.60; Fort Elliott, 2.50; Corpus Christi, 2.25; and Brenham, 2.24; and the following named places report amounts less than one inch: Abilene, Belton, Cuero, Hearne, Longview, Luling, Rio Grande City, and San Antonio. The greatest amount of precipitation in any twenty-four hours occurred at Orange, 5.49, on the 6th. Columbia had 3.04 on the 4th, and Palestine 2.57 inches on the 6th. The average precipitation for four months ending July 31st was somewhat in excess of the average for the state. The greatest monthly precipitation was 7.83 at Tyler, and the least monthly precipitation, 0.10, at Longview.—*S. O. Young, M. D., Galveston, director; Allen Buell, Sergeant, Signal Corps, assistant.*

*Meteorological record of voluntary observers and Army post surgeons, July, 1888.*

The maximum and minimum temperatures at stations marked thus (\*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<i>Alabama.</i>					<i>California—Cont'd.</i>				
Auburn.....	93	66	80.0	4.55	Hydesville.....	85	41	60.4	0.27
Bermuda.....	95	73	81.0	2.05	Lewis Creek.....	106	66	83.0	.....
Carrollton.....	91	72	80.0	5.70	Needles.....	113	71	94.3	1.38
Citronville.....	100	62	83.2	2.13	Oakland.....	91	52	62.2	.....
Edwardsville.....	97	71	80.7	6.00	Oroville.....	102	56	79.8	0.07
Eufaula.....	97	65	80.0	1.65	Presidio of San F.....	87	53	59.5	.....
Florence.....	93	73	81.0	2.23	Salinas.....	100	48	70.2	0.01
Fort Deposit.....	98	64	80.0	2.92	Sacramento.....	84	54	61.4	0.00
Gadsden.....	94	64	79.0	2.75	Santa Barbara.....	86	52	67.0	0.00
Greensborough.....	94	70	82.0	3.37	Santa Maria.....	89	48	66.0	0.00
Livingston.....	95	75	84.0	2.02	Willow.....	111	49	80.1	0.08
Marion.....	100	68	82.8	2.70	<i>Colorado.</i>				
Mt. Vernon B'ks.....	99	67	83.1	2.67	Bennett.....	115	65	.....	.....
Mount Willing.....	98	64	78.5	2.45	Fort Lewis.....	90	40	66.3	1.54
New Market.....	89	71	78.9	5.74	Georgetown.....	84	46	62.5	2.82
Opelika.....	100	65	80.9	2.80	<i>Connecticut.</i>				
Pine Apple.....	100	65	83.2	.....	Canton.....	92	44	.....	3.14
Selma.....	97	76	84.2	2.90	Hartford a.....	88	52	70.6	1.90
Talladega.....	93	64	81.8	4.83	Hartford b.....	88	52	70.4	2.35
Troy.....	97	73	81.0	4.27	Mansfield.....	87	50	66.4	1.93
Tusculum.....	94	65	83.4	1.72	Middletown.....	90	49	67.6	1.92
Tusculum.....	98	69	80.6	0.76	New Hartford.....	90	52	67.8	4.24
Union Springs.....	97	70	81.0	1.33	Shelton.....	86	46	67.8	2.42
Valley Head.....	94	67	77.0	2.72	Southington.....	88	57	69.2	1.85
<i>Arizona.</i>					Thompson.....	85	49	67.6	.....
Antelope Valley.....	.....	.....	.....	2.14	Voluntown.....	92	58	.....	1.75
Bangharts.....	.....	.....	.....	1.60	Waterbury.....	91	44	66.4	2.73
Cedar Springs.....	.....	.....	.....	0.69	<i>Dakota.</i>				
Fort Huachuca.....	97	59	.....	7.96	Brookings.....	101	42	70.4	1.61
Fort McDowell.....	116	61	93.0	0.85	Davenport.....	97	48	69.9	3.04
Fort Mojave.....	114	52	.....	0.20	Fort A. Lincoln.....	97	50	70.7	2.32
Globe.....	.....	.....	.....	2.47	Fort Meade.....	98	54	.....	3.64
Holbrook.....	100	49	77.0	0.68	Fort Pembina.....	94	44	69.8	3.06
Showlow.....	.....	.....	.....	.....	Fort Sisseton.....	100	49	70.1	3.40
Teviston.....	.....	.....	.....	1.58	Fort Sully.....	106	51	76.0	3.40
Tucson.....	105	85	.....	0.43	Fort Totten.....	101	50	67.8	2.95
Winslow.....	.....	.....	.....	0.43	Fort Yates.....	101	50	73.0	3.68
Williams.....	.....	.....	.....	1.35	Garden City.....	97	46	70.4	4.55
<i>Arkansas.</i>					Galatin.....	.....	.....	67.0	.....
Alexander.....	100	70	82.5	2.12	Highmore.....	104	51	.....	5.79
Conway.....	98	65	82.7	3.41	Kimball.....	104	50	66.9	0.90
Dallas.....	99	68	82.8	8.89	New England City.....	97	42	73.0	1.16
Dayton.....	98	74	82.1	6.70	Parkston.....	96	40	67.6	4.05
Devall's Bluff.....	98	59	81.3	2.98	Richardton.....	98	52	69.8	4.05
El Dorado.....	94	60	74.3	1.95	Webster.....	101	52	74.2	2.88
Forrest City.....	97	56	82.2	0.60	Woonsocket.....	107	45	75.1	1.62
Heber.....	99	60	80.9	1.00	<i>District of Columbia.</i>				
Helena.....	99	63	82.3	2.30	Distribut'g res'r'r.....	91	60	76.0	3.10
Hot Spring.....	.....	.....	.....	1.22	Kendall Green.....	107	50	76.4	0.36
Lead Hill.....	111	58	84.2	1.15	Receiving res'r'r.....	91	61	75.6	3.56
Lonoke.....	99	66	83.0	3.62	Washington aq.e.....	95	64	78.8	.....
Malvern.....	103	70	87.8	0.26	<i>Florida.</i>				
Monticello.....	98	61	82.4	2.85	Altamonte Springs.....	98	71	.....	.....
Newport.....	105	64	84.1	2.10	Alva.....	92	71	78.3	5.95
Ocala.....	95	62	82.4	1.15	Archer.....	102	65	82.2	3.74
Ozone.....	94	66	78.3	3.54	Fort Meade.....	97	76	82.0	10.17
Pine Bluff.....	99	64	83.8	5.31	Homeland.....	97	72	82.7	7.45
Portia.....	103	67	83.8	3.48	Manatee.....	94	73	84.3	4.26
Russellville.....	100	63	82.7	3.70	Merritt's Island.....	96	72	80.2	5.65
Stuttgart.....	96	68	81.3	1.70	St. Francis Bar'cks.....	92	69	80.8	3.40
Texaskana.....	100	62	83.4	1.62	Tallahassee.....	93	71	81.7	3.45
Washington.....	97	62	80.9	4.23	<i>Georgia.</i>				
<i>British Columbia.</i>					Andersonville.....	100	65	73.8	3.15
New Westminster.....	86	49	63.4	1.47	Athens.....	99	62	79.0	1.79
<i>California.</i>					Forsyth.....	97	70	82.0	3.08
Alcatraz Island.....	66	51	58.4	.....	Marietta.....	95	65	78.0	2.48
Angel Island.....	95	52	63.4	0.18	Milledgeville.....	95	66	81.4	2.44
Banning.....	103	54	.....	0.22	<i>Idaho.</i>				
Barstow.....	107	52	80.8	0.01	Boise Barracks.....	103	44	75.6	0.76
Benicia Barracks.....	.....	.....	69.2	0.36	Fort Sherman.....	97	38	66.0	0.24
Fort Bidwell.....	96	40	70.8	0.30	Lewiston.....	103	56	.....	0.34
Fort Gaston.....	104	37	69.9	0.30	<i>Illinois.</i>				
Fort Mason.....	.....	.....	61.3	0.04	Aledo.....	100	54	75.4	4.60
Georgetown.....	99	46	.....	0.04	Benson.....	98	56	75.2	3.75